



# University of Waterloo

## Final Examination

Term: Fall 2007

<b>Student Name</b>
<b>UW Student ID Number</b>

Course Abbreviation and Number	AFM 372
Course Title	Math Managerial Finance 2
Instructor	Alan Huang

Date of Exam	December 10
Time Period	Start time: 12:30 pm      End time: 3:00
Number of Exam Pages	16 pages (including cover sheet, additional scratch sheet, formula & table sheets)
Exam Type	Closed Book
Additional Materials Allowed	Calculator (any form of calculator may be used)

**MARKING SCHEME:**

Question	Score	Question	Score
I. (30 points)		IV.1 (11 points)	
II.(8 points)		IV.2 (17 points)	
III. (12 points)		IV.3 (7 points)	
		IV.4 (8 points)	
		IV.5 (7 points)	
<b>Total 100</b>			

**Instructions for Part IV (Calculations):**

1. Show process to get partial credit;
2. If the correct number has more than four decimal points, please specify dollar amount to 2-decimal places (e.g., \$1.23), percentage to 2-decimal places (e.g., 11.15%), and all other numbers to 4 decimal places (e.g., 0.8333).
3. Feel free to tear the formula sheet and table pages (the last two pages) from the exam book.

**I. Multiple choice questions: Circle one answer that is the best.** (Questions 1 to 10 are worth 1 point each, and questions 11 to 20 are worth 2 points each.)

1. Investment bankers perform which services for corporate issuers:

- A) evaluate type of security to issue and how to issue it.
- B) aid in pricing and selling the new issue.
- C) engage in market stabilization.
- D) all of the above.
- E) none of the above.

2. Under the \_\_\_\_\_ method, the underwriter buys the securities for less than the offering price and accepts the risk of not selling the issue, while under the \_\_\_\_\_ method, the underwriter does not purchase the shares but merely acts as an agent.

- A) best efforts; firm commitment
- B) firm commitment; best efforts
- C) general cash offer; best efforts
- D) competitive offer; negotiated offer
- E) seasoned; unseasoned

3. A farmer is planting corn in May. His production costs are \$1.50 per bushel. He is worried about the selling price of his corn when he harvests it in Sept. What can he do to reduce the selling price uncertainty?

- A) Buy corn insurance that insures against natural catastrophes during the production phase.
- B) Buy a Sept. corn put option
- C) Sell a Sept. corn futures contract
- D) All of the above
- E) Both B and C.

4. If the securities market is efficient an investor need only throw darts at the stock pages to pick securities and be just as well off.

- A) This is true because there are no differences in risk and return.
- B) This is true because in an efficient stock market prices do not fluctuate.
- C) This is false because professional portfolio managers prefer to generate commissions.
- D) This is false because investors may not hold a desirable risk-return combination in their portfolio that matches their preferences.
- E) This is false because the markets are controlled by the institutional investors.

5. A corporation has 2000 shares outstanding, and 6 directors are up for election. The stock features cumulative voting. About how many shares do you have to own to guarantee electing at least yourself to one position on the board of directors (ignoring possible ties)?

- A) 1000.
- B) 333.
- C) 287.
- D) 1715.
- E) 343.

6. You own a put option with time to expiration of 6 months. The underlying stock is selling for \$15 and your exercise price is \$12, this option:

- A) must be sold to the writer.
- B) is in-the-money.
- C) is out-of-the-money.
- D) must be offset by a call.

7. The post-earnings announcement drift phenomenon refers to a phenomenon that firms with unexpectedly high earnings earn abnormally high returns for several months after the announcement. This would be evidence of:

- A) efficient markets in the weak form.
- B) inefficient markets in the weak form.
- C) efficient markets in the semi-strong form.
- D) inefficient markets in the semi-strong form.
- E) inefficient markets in the strong form.

8. A potential disadvantage of forward contracts versus futures contracts is:

- A) the extra liquidity required to cover the potential outflows that occur prior to delivery and caused by marking to market.
- B) the incentive for a particular party to default.
- C) that the buyers and sellers don't know each other and never meet.
- D) all of the above.
- E) both a and c.

9. The Federal Reserve Board decreases open-market purchases, which results in a general increase in interest rates. As a result, the price of Specific Car stock drops. Which of the following correctly describes the impact of these changes on the price of the call option for Specific Car stock?

- A) Both changes cause the price of the call option to decrease.
- B) Both changes cause the price of the call option to increase.
- C) The higher interest rate will cause the price of the call option to decrease. The lower price of the stock will cause the price of the call option to increase.
- D) The higher interest rate will cause the price of the call option to increase. The lower price of the stock will cause the price of the call option to decrease.
- E) The higher interest rate has no direct effect on the price of the call option. The lower price of the stock will cause the price of the call option to decrease.

10. Curtiss' Cowboy Hat Company recently completed a merger. When valuing the combined firm after the merger, which of the following is an example of the type of common mistake that can occur?

- A) The use of market values for both firms in valuing the new firm.
- B) The inclusion of cash flows that are incremental to the decision.
- C) The use of Curtiss' discount rate when valuing the cash flows of the entire company.
- D) The inclusion of all relevant transactions cost associated with the acquisition.
- E) None of the above.

11. Suppose the only debt Firm ABC has in its capital structure is a zero-coupon bond with face value of  $B$ . To view firm equity ownership as a put, which of the following is the correct statement?

- A) Stockholders **own** the firm, **own** a put option on the firm with an exercise price of  $B$ , and **borrow** a safe bond with  $B$  in interest and principal owed to bondholders.
- B) Stockholders **own** the firm, **sell** a put option on the firm with an exercise price of  $B$ , and **borrow** a safe bond with  $B$  in interest and principal owed to bondholders.
- C) Stockholders **don't own** the firm, **own** a put option on the firm with an exercise price of  $B$ , and **lend** a safe bond to bondholders with  $B$  due.
- D) Stockholders **own** the firm, **own** a put option on the firm with an exercise price of  $B$ , and **lend** a safe bond to bondholders with  $B$  due.

12. You purchase one IBM December call contract. One contract gives you the right to buy 100 shares at an exercise price of \$100 per share. The cost of a call option (per share) is \$6. Current stock price is \$95. What is the minimum **profit** that you can gain from this strategy?

- A) \$0
- B) -\$600
- C) \$9,400
- D) Infinity
- E) -\$9,500

13. Nick Leeson broke Barings by engaging in freelance derivatives trading in 1995. He had positions in straddles and futures on Nikkei 225. Nikkei 225 tanked during his trading period, which led to enormous loss to his firm, Barings. Which of the following could have resulted in the most loss?

- A) Long straddles and long futures
- B) Long straddles and short futures
- C) Short straddles and long futures
- D) Short straddles and short futures

14. A firm has 500 shares of stock and 100 warrants outstanding. Each warrant gives the owner the right to buy 5 shares at \$25 per share. The warrants are about to expire immediately, and all of them will be exercised. The market value of the firm's assets is \$25,000, and the market value of the debt is \$8,000. What in the following is closest to the value of **one warrant**?

- A) 22.50
- B) 4.50
- C) 12.50
- D) 62.50
- E) Not enough information, since we don't know the value of the corresponding call.

15. The following table gives you two bonds which pay the principal at the end of the bond maturity:

Bond	Time to maturity (years)	Coupon rate (Annual payment)	Par value	S&P's Credit rating
A	5	10%	\$1,000	AAA
B	5	10%	\$1,000	C

Which bond has higher duration?

- A) Bond A.
- B) Bond B.
- C) Bond A and B have the same duration.
- D) Not enough information.

16. You buy one corn futures contract for \$2.60 per bushel on day 1. The futures price moves to \$2.52, \$2.50, \$2.48, \$2.65, and \$2.70 from days 2 to 6 respectively. The size of each contract is 5,000 bushel. The initial margin is \$2,000 and the maintenance margin is \$1,500. At the end of which day will you receive a margin call?

- A) Day 2
- B) Day 3
- C) Day 4
- D) Day 5
- E) Day 6
- F) I don't receive a margin call during those days.

17. A convertible bond has an 8% annual coupon and 15 years to maturity. The bond pays interest semi-annually. The face value is \$1,000 and the conversion ratio is 40. The stock currently sells for \$20.875 per share. Similar nonconvertible bonds are priced to yield 9% annually. The value of the convertible bond is at least:

- A) \$ 835.00.
- B) \$ 918.56.
- C) \$1,000.00.
- D) \$1,570.11.
- E) none of the above.

Questions 18 and 19 are based on the following information:

Schaeffer Shippers announced today that it will dissolve one year from now. The firm does not pay any dividend. The firm's stock price is currently at \$70 per share and its equity cost is 10%. Assume that the liquidating cost is zero and that Schaeffer is fairly priced.

18. Assume there are no taxes. You hold 100 shares and you want an equal consumption from your holdings of the stock today and one year from now. What should you do?
- A) Sell 50 shares today and hold the rest shares until one year from now.
  - B) Sell 52.38 shares today and hold the rest shares until one year from now.
  - C) Sell all your 100 shares today and invest in risk free assets at 5% of return.
  - D) Borrow \$3,500 today at an interest rate of 5% and repay the loan one year from now.
19. Now assume that all investors are in the 33% tax bracket. Shortly after the previous announcement, Schaeffer Shippers announced that it will pay a special dividend of \$5.00 per share to all holders on record as of May 31st. The firm's stock price is still \$70 per share at this announcement. Given that the ex-dividend date is May 29, what should happen to Schaeffer's stock price on May 29?
- A) Stock price would remain at \$70.
  - B) The stock price should fall by \$3.35.
  - C) The stock price should fall by \$5.
  - D) The stock price should fall by \$1.65.
  - E) The stock price will fall on May 31<sup>st</sup> rather than on May 29<sup>th</sup>.
20. Two all-equity firms with the same number of shares outstanding and EPS combine in a non-synergistic merger. The acquiring firm has a P/E (price to earnings ratio) of 6 while the acquired firm has a P/E of 10. The combined firm has an equal equity proportion from each of the original firms. What is the P/E ratio for the merged firm?

- A) 8
- B) 10
- C) 6
- D) 7.5
- E) 8.5

**II. Short answer questions.**

1. Give two advantages and two disadvantages of employee stock option plans. (4 points)

2. Briefly explain how “winner’s curse” contributes to IPO underpricing. (4 points)

**III. True or false.** Assess whether each of the following statements is true, false, or uncertain. Justify your answer. All marks are based on the quality of your arguments. (4 points each)

1. It's never optimal to exercise an American call early.

2. In the payoff graph, it is easy to show that buying a call and shorting a put with the same strike and time to expiry simultaneously is equivalent to buying the underlying stock. This implies that the put and call must have the same value.

3. Seeing that oil price has been increasing, you are borrowing money to buy oil futures. You reason that this way you don't have to use your own money and you can reduce the risk. Your financial advisor tells you that you are equally well off by just investing in the oil spot.

#### IV. Calculations

1. (11 points) You are considering acquiring 100% ownership of Breckenridge, a ski resort. The resort's current operating gives a net operating income of -\$10,000 per year in perpetuity. After the acquisition, you have the option to increase the number of ski trails by 1 one year from now at a setup cost of \$700,000. Each ski trail gives you an expected value of cash flows of \$840,000 once built (i.e., the setup cost excluded). The cost of capital for the ski trail and the resort is 20%. The standard deviation of return on the ski trails is 30%. The riskfree rate is 5% per annum.

(a) Should you go ahead with the acquisition? Show your process clearly. If necessary, use Table 23.3 (attached as the last page of the exam book). (8 points)

(b) A nearby resort Copper Mountain is publicly traded and has similar operating as Breckenridge. You are concerned about the risk of acquiring Breckenridge because the standard deviation of returns is high. Your financial advisor tells you that you can buy Copper Mountain's stock to reduce the acquisition risk. Does this make sense? (3 points)



2. (17 points) Assume today is Nov. 21, 2007. The following are call, put, and warrant prices for a stock today:

Last Transaction Prices (\$)			
Security	Strike Price	Maturity	
		December, 07	June, 08
Call	65	2	2.30
	75	--	--
Put	65	3	--
	75	--	10.25
Warrant	75	--	?

The maturity dates of the options are on Fridays preceding the third Saturday in each month. Therefore, the December options expire 1 month from now, and the June options expire 7 months from now. The annual risk free interest rate is 7%. The stock closed at \$65.25 today. There are 1 million shares outstanding. There are 100,000 June \$75 warrants outstanding, each warrant giving the holder the right to buy 1 share.

a. Assuming that trading is costless and there are no taxes, identify a violation of the put-call parity condition. Find a risk-free arbitrage strategy based on trading one share of stock, indicate your profit and clearly show that it works. (8 points)

Question 2 cont'd

b. Find the value of the June \$75 warrant. (5 points)

c. Historically, the stock is traded with very low volatility. Your financial advisor therefore advises you to avoid buying calls on this stock because the call would not be worth much. He specifically points out the June \$65 call is not worth buying. Would you follow his advice? Explain. (4 points)

3.(7 points) Companies A and B have been offered the following rates per year on a \$200 million 10-year loan:

	Fixed Rate	Floating Rate
A	7.7%	LIBOR+0.2%
B	9.4%	LIBOR+1.4%

Company A requires a floating rate loan while company B requires a fixed rate loan. Design a swap that will net a bank, acting as an intermediary, 0.1% per year and which will appear equally attractive to both A and B.

4. (8 points) New Business Ventures, Inc., has an outstanding bond maturing in 5 years with a face value equal to \$1,000 and a 9% coupon rate with annual coupon payment. The bond is callable after 2 years with a call premium of \$50 (and it is the only date on which it may be called). It is forecasted that there is a 40% chance that the interest rate will rise to 12%, and a 60% chance that the interest rate will fall down to 8% two years from now. The current interest rate is 10%. What is the current market price of this callable bond?

5. (7 points) Trinity Biotech Plc (NYSE: TRIB) is considering acquiring 100% of Community Health Network (CHN). Prior to the acquisition (there is no information leakage), CHN has 1 million shares outstanding with a stock price of \$2.3 per share and a P/E ratio of 10, and TRIB has 5 millions shares outstanding with a stock price of \$8.0 per share and a P/E ratio of 8. The acquisition of CHN will create a synergy that has a present value of \$0.5 million.

a. TRIB is considering an all-cash offer. How much should it offer to CHN so that that the acquisition premium is 80% of the synergy? (2 points)

b. Now assume TRIB is considering an all-stock offer. How many shares should be offered to CHN so that the acquisition premium is 80% of the synergy? (5 points)

Additional page (no content on this page--for use as a scratch sheet)

The page number for the Formula sheet and table should be 15 and 16.

## AFM371/372 2007: Formulae sheet for the Final

- Annuity factor:  $A_r^T = \frac{1}{r} \left[ 1 - \frac{1}{(1+r)^T} \right]$
- CAPM:  $r_i = r_f + \beta_i [E(r_m) - r_f]$
- Cumulative voting threshold of percentage ownership for one candidate:  $\frac{1}{1+N}$
- Dividend policy:  
 After-tax return = [dividend(1-div.tax) + capital gains (1-cap. gains tax)]/price  
 Price change on ex-div. day:  $\frac{P_b - P_a}{D} = \frac{1 - T_d}{1 - T_g}$

- Value of rights:

$$R_0 = \frac{M_0 - S}{N + 1}$$

- Option pricing with binomial models

– Portfolio replicating method

$$\Delta = \frac{V_{1,u} - V_{1,d}}{S_{1,u} - S_{1,d}}, \quad B = \frac{V_{1,u} - \Delta S_{1,u}}{1 + r_f}, \quad V_0 = \Delta S_0 + B$$

– Risk-neutral pricing method

$$q = \frac{(1 + r_f) - d}{u - d}, \quad V_0 = \frac{qV_{1,u} + (1 - q)V_{1,d}}{1 + r_f}$$

- Arbitrage bounds for non-dividend paying call options

$$S_t \geq C_t \geq \max(S_t - Xe^{-r(T-t)}, 0)$$

- Black-Scholes formulae for non-dividend paying assets

– Call:  $C_t = S_t N(d_1) - Xe^{-r(T-t)} N(d_2)$

– Put:  $P_t = Xe^{-r(T-t)} N(-d_2) - S_t N(-d_1)$

where  $d_1 = \frac{\ln(S_t/X) + (r + \frac{1}{2}\sigma^2)(T-t)}{\sigma\sqrt{T-t}}$  and  $d_2 = d_1 - \sigma\sqrt{T-t}$

- Put-call parity:

$$C + Xe^{-r(T-t)} = P + S$$

- Value of a warrant:  $W = \frac{N}{N + N_w} C$

- Value of convertible bond = max (straight bond value, conversion value) + warrant value.

- Forward price of non-dividend paying underlying asset:  $F_0 = S_0 e^{r_f T}$   
 (Discrete compounding:  $F_0 = S_0 (1 + r_f)^T$ )

- Duration and immunization

– Duration:  $D = \sum_{t=1}^T t W_t$ , where  $W_t = \frac{CF_t / (1+r)^t}{\text{Bond price}}$

– Portfolio duration:  $D_p = \sum_i w_i D_i$

– Duration and interest rate risk:  $\frac{dP}{P} = \frac{-1}{1+r} \times D \times dr$

**Table 23.3 Cumulative Probabilities of the Standard Normal Distribution Function**

<b>d</b>	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0754
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2258	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2518	0.2549
0.7	0.2580	0.2612	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2996	0.3023	0.3051	0.3079	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4430	0.4441
1.6	0.4452	0.4463	0.4474	0.4485	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4700	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4762	0.4767
2.0	0.4773	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4865	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4980	0.4980	0.4981
2.9	0.4981	0.4982	0.4983	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990